Antriebs- und Steuerungstechnik

CC10.3

Machine Parameter

Version 101

BOSCH

Automationstechnik

CC10.3

Machine Parameter

1070 072 153-101 (95.09) GB

Reg. Nr. 16149-03

Discretionary charge 10.– DM

Safety instructions and reading help

Read this instruction manual before you use the CC10.3. Keep this manual in a place where it is always accessible to all users.

Standard operation

This instruction manual contains all of the information required for standard operation of the described products.

The products described were developed, manufactured, tested and documented in accordance with the relevant safety standards. There should be no risk of danger to personnel or property if the specifications and safety instructions relating to the project phase and installation and correct operation of the product are followed.

Qualified personnel

This instruction manual is designed for specially trained PLC personnel. The relevant requirements are based on the job specifications as described by the ZVEI, see:
Anforderungsprofile für NC−Fachkräfte
I + K SPEKTRUM 19
Hrsg.: ZVEI
Stresemannallee 19
60596 Frankfurt
Federal Republic of Germany
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This instruction manual is designed for NC comissioners. These comissioners require special knowledge of NC controllers.

Interventions in the hardware and software of our products which are not described in this instruction manual may only be performed by our skilled personnel.

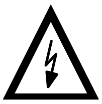
Unqualified interventions in the hardware or software or non-compliance with the warnings listed in this instruction manual or indicated on the product may result in serious personal injury or damage to property.

Qualified personnel are persons who

- as **planning personnel**, are familiar with the safety guidelines used in electrical engineering and automation technology.
- as **operating personnel**, are familiar with the equipment used in the field of automation technology and are thus familiar with the operating instructions in this manual.
- as **commissioning personnel**, are authorized to commission, ground and classify electric circuits and devices/systems in accordance with the relevant safety standards.

Safety instructions on the control components

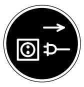
The following warnings and notices may be indicated on the control components themselves and have the following meaning:



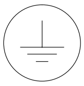
Danger: High voltage!

Danger: Battery acid!

Electrostatically−sensitive components!



Disconnect at mains before opening!



Pin for connecting PE conductor only!

For screened conductor only!

Safety instructions in this manual

☞

These symbols are used throughout this manual subject to the following conditions.

DANGER

This symbol is used to warn of the presence of **dangerous electrical current.** Insufficient or lacking compliance with these instructions can result in **personal injury.**

Safety instructions accompanied by this symbol are serially numbered, for example 0.1. The appendix provides translations of the safety notes shown here in all the official EC languages.

DANGER

This symbol is used wherever an insufficient or lacking compliance with instructions can result in **personal injury**.

Safety instructions accompanied by this symbol are serially numbered, for example 0.1. The appendix provides translations of the safety notes shown here in all the official EC languages.

CAUTION

This symbol is used wherever an insufficient or lacking compliance with instructions can result in **damage to equipment or files**.

Safety instructions accompanied by this symbol are serially numbered, for example 0.1. The appendix provides translations of the safety notes shown here in all the official EC languages.

☞

This symbol is used to inform the user of special features.

Safety instructions

DANGER

0.1
Danger to persons and equipment!
Test every new program before operating the system!

CAUTION

0.2
Danger to the module!
Do not insert or remove the module when the control is switched on! This can destroy the module. Switch off or remove the power supply module of the control, external power supply and signal voltage before inserting or removing the module!

CAUTION

0.3
Danger to the module!
All ESD protection measures must be observed when using the module! Avoid electrostatic discharges!

Observe the following protective measures for electrostatically endangered modules (EEM)!

- The employees responsible for the storage, transport and handling must be trained in ESD protection.
- EEMs must be stored and transported in the protective packaging specified.
- EEMs may basically only be handled at special ESD work places set up specifically for this purpose.
- Employees, work surfaces and all devices and tools, which could come into contact with EEMs must be same potential (e.g. earthed).
- Wear an approved earthing strap around your wrist. The grounding bracelet must be connected via a cable with integrated 1 M resistance with the work surface.
- EEMs may on no account come into contact with chargeable objects, these include most plastics.
- When inserting EEMs into devices and removing them, the power source of the device must be switched off.

1. GENERAL 1–1

2. MACHINE PARAMETERS 2–1

CONFIGURATION 2–1

CC 10 Interface structure 2–4

AXIS VALUES 2–5

MEASURING SYSTEM 2–7

AXIS DYNAMIC 2–18

User planning sheet for SMOOTH ACCELERATION 2–27

AUXILIARY FUNCTIONS 2–31

INTERFACES 2–34

FUNCTION KEYS 2–36

3. ANNEX 3–1

1. GENERAL

This description refers to the CC 10.3 operating system software as from version C40.

The machine parameters are stored in the machine parameter program (MPP). The MPP adapts the operating system of the CC 10.3 to the machine tool. The machine parameters can be modified in accordance with the specific application.

Note

- Since the machine parameters are closely related to the characteristic values for the mechanical system, motor, measuring system and machine functions, the machine parameters must be changed only by the machine tool manufacturer.

The machine parameters are not defined upon delivery of the CC10.3. The following dialogue appears on selection of the function block MEM and the function MPP as long as the machine parameters have not been defined:

FLASH NO DATA
COPY RAM DATA ? YES / NO

YES: Accept standard values from operating software area
NO: Input of Manual / Read-in via interface of PC

The preassigned values (default values) are shown in the appendix.

2. MACHINE PARAMETERS

CONFIGURATION

Parameter	Significance	Explanation
[P0010] [98765]	No. of the CC10 Value range: 1 – 99999	Any 5–digit number can be entered in P0010 to identify the CC 10 module.
[P0011] [1]	LANGUAGE	Changeover between languages: 1 = German 2 = English The machine parameters can be read in via the V.24/20 mA interface. In this case, however, parameter P0011 must first be set to the same language (by hand if necessary) as that in which the parameters are defined on the data medium (German or English).
[P0020] [3]	NUMBER OF AXES	Specifies the number of axes as 1, 2 or 3.
[P0021] [8]	REALTIME CLOCK	Since the axes are operated in the position control loop, it is necessary to refresh the position control loop at defined time intervals (position detection and setpoint output). The time intervals (REAL TIME CLOCK) can be set in parameter P0021. **Important**: Small time intervals for operation of the control loop increase the reaction time of the remaining system with respect to interface signals and block processing (block cycle time). Longer time intervals reduce the reaction times and the CC 10 reacts faster to interface signals such as START, for example. A further criterion for selection of the ”correct” sampling time is the type of final control element. Servo or proportional valves require very short sampling times, while longer sampling times can usually be chosen in conjunction with electric drives and ball screws (this benefits the block cycle time). Two time bases, namely1.5 ms and 1.8 ms are available per axis for adjustment of the sampling times.

P0021 is defined in accordance with the following table.

	[P0021]	Sampling time in [ms] for 1 axis	for 2 axes	for 3 axes
Time base 1,5 ms	0	–	–	–
	1	4,5	6,0	7,5
	2	6,5	7,5	9,0
	3	7,5	9,0	10,5
	4	9,0	10,5	12,0
	5	10,5	12,0	13,5
	6	12,0	13,5	15,0
	7	13,5	15,0	16,5
Time base 1,8 ms	8	3,6	5,4	7,2
	9	5,4	7,2	9,0
	10	7,2	9,0	10,8
	11	9,0	10,8	12,6
	12	10,8	12,6	14,4
	13	12,6	14,4	16,2
	14	14,4	16,2	18,0
	15	16,2	18,0	19,8

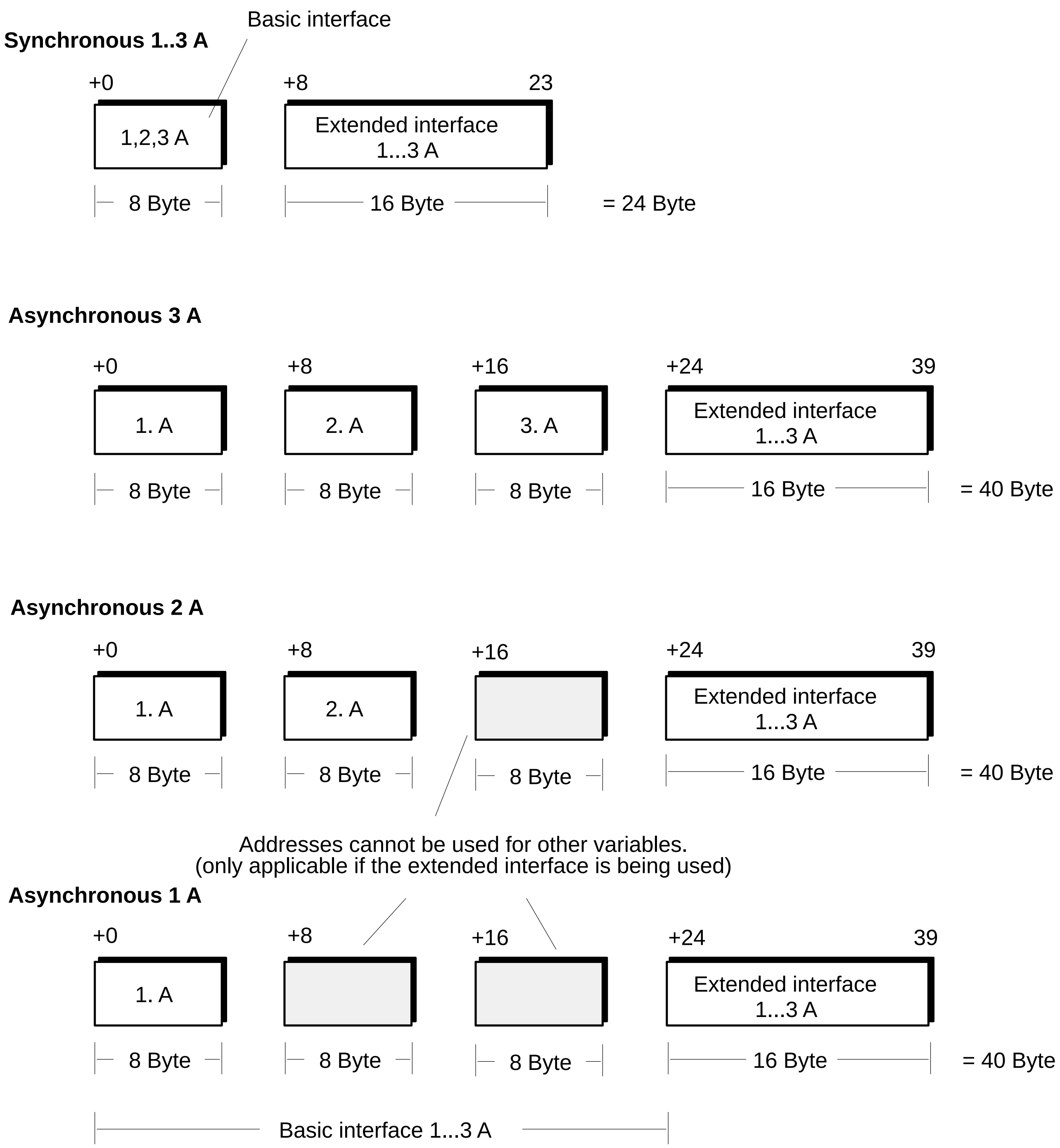
Example:
The control loop of each axis should be refreshed after 12 ms on a CC 10 with 2 axes.
Input in [P0021] [5]

The minimum control loop sampling times are limited. The minimum sampling times which can be achieved are listed in the following table for various typical axis configurations.

	1 axis synchronous	2 axes synchronous	3 axes synchronous	1 axis asynchronous	2 axes asynchronous	3 axes asynchronous
Linaer axes with incremental measuring systems and linear acceleration function	4,5 ms	6,0 ms	9,0 ms	4,5 ms	6,0 ms	7,2 ms
Linear axes with incremental measuring systems and soft acceleration function	4,5 ms	7,2 ms	10,5 ms	5,4 ms	7,2 ms	10,5 ms
Rotary axes with incremental measuring systems and linear acceleration function	4,5 ms	6,0 ms	9,0 ms	4,5 ms	6,0 ms	9,0 ms
Rotary axes with incremental measuring systems and soft acceleration function	4,5 ms	7,5 ms	10,5 ms	4,5 ms	7,2 ms	9,0 ms
Linear/rotary axes with absolute measuring systems and linear acceleration function	6,0 ms	7,2 ms	10,5 ms	6,0 ms	7,2 ms	10,5 ms
Linear/rotary axes with absolute measuring systems and soft acceleration function	6,0 ms	9,0 ms	12,6 ms	6,0 ms	9,0 ms	12,6 ms

[P0030] [0]	AXIS CONFIGURATION SYNCHRONOUS	The axes can be operated as 1 x 3 synchronous axes or as 3x1 asynchronous axis. 0 = Synchronous 1 = Asynchronous
[P0042] [1]	EXTENDED INTERFACE YES	The basic interface can be extended for supplementary functions. (Refer to ”Interface Conditions”/digital interface expansion). An additional 16 BYTES are required per device for expansion (refer to Figure 1). [0] EXT. INTERFACE NO [1] EXT. INTERFACE YES

CC 10 Interface structure



Note: 1. If only one axis is applied, it is advisable to define parameter P0030 as ”SYNCHRONOUS”. In this case, 16ÿbytes fewer of I/O addresses are required than for ”ASYNCHRONOUS” axes.
2. In asynchronous mode with the extended interface, 40 bytes of standard interface data must generally be transferred, even if only 1 or 2 axes are applied.

AXIS VALUES

[P0100] NAME OF AXIS
[X01= X02 = X03=]

The axis designations can be largely chosen as desired.

The following rules apply:

- max. 4 alphanumeric characters
- The 1st character of the axis name must not already have been used for an NC function. E.g. no
  N (block number)
  G (G function)
  A (acceleration program) etc.
  R (radius programming for circular interpolation) etc.
- The first and last characters must not consist of numbers so that defined separation between the axis name and traversing distance is possible.
- The axis names of all axes present in a device must have the same number of characters
- There must be no blanks (spaces) in the axis name.

Example: The 3 axes of a CC 10 are to receive the coordinate designations X, Y, Z for a handling task.
Input in [P0100]
[X Y Z]

Note: Owing to the definable axis designation, acceleration programming (A...) has been changed compared with the previous operating software C12B, refer to the programming instructions, function ”acceleration A”.

The input sequence also defines the channel number of asynchronous axes.
In this example, the channel assignments are as follows:
X ––> channel No. 1
Y ––> channel No. 2
Z ––> channel No. 3

[P0110]	TYPE OF AXIS	
[X01=]	[0]	LINEAR AXIS
[X02=]	[0]	LINEAR AXIS
[X03=]	[0]	LINEAR AXIS

The axes X01 to X03 can be defined as rotary or linear axes.
0 = Linear axis
1 = Rotary axis

[P0111]	OPTIMUM PATH	
[X01=]	[0]	NO
[X02=]	[0]	NO
[X03=]	[0]	NO

Parameter P0111 applies only in conjunction with parameter P0110 ”rotary axis”.
Optimum path means that the programmed position is approached by the shortest possible route.
0 = Not optimum path
1 = Optimum path

[P0140]	POSITION		Parameter P0140 applies only in conjunction with parameter P0110 ”rotary axis”. This parameter defines how the preset displacement is to be interpreted in the part program of the CC 10. 0 = Preset displacement in revolutions 1 = Preset displacement in degrees
[X01=]	[0]	IN REVOLUTIONS	
[X02=]	[0]	IN REVOLUTIONS	
[X03=]	[0]	IN REVOLUTIONS	

[P0141]	MINIMUM DIST.	If the CC 10 possesses a measuring system resolution of 1/1000 mm, the max. possible traversing distance is ¿19999.999 mm. This distance can be increased by a factor of 10 if the measuring system resolution is 1/100 mm. The traversing distance is then 199999.99 mm Input [1] = 19999.999 mm [10] = 199999.99 mm
[X01=]	[1]	
[X02=]	[1]	
[X03=]	[1]	

[P0150]	UNIT MEAS.		The unit of measure for the measuring system pulses must be defined in accordance with parameter P0110. 0 = Pulses/degree 1 = Pulses/mm
[X01=]	[1]	PULSES/MM	
[X02=]	[1]	PULSES/MM	
[X03=]	[1]	PULSES/MM	

MEASURING SYSTEM

[P0200]	FEEDBACK FALT
[X01=]	[1000.00]
[X02=]	[1000.00]
[X03=]	[1000.00]
	Value range:
	0.01 – 10000.00

Parameter P0200 is used to evaluate the measuring system pulses.
The unit of measure is as defined in P0150.
– pulses/mm or
– pulses/degree

1000 pulses/mm means that the smallest unit which can be travelled with the axis is 0.001 mm.
The parameter P0200 must be defined in combination with parameter P0202
(Also refer to the description for P0202).

P0200 is calculated according to the following formula in conjunction with **incremental** measuring systems:

$$\text{P0200} = \frac{\text{Measuring syst. pulses x 4 (four–fold eval.)}}{\text{Displacement (spindle lead)}} = \frac{\text{P0202 x 4}}{\text{Displacement (Spindle lead)}}$$

P0200 is calculated according to the following formula in conjunction with **absolute** measuring systems:

$$\text{P0200} = \frac{\text{Measuring syst. pulses}}{\text{Displacement (spindle lead)}} = \frac{\text{P0202}}{\text{Displacement (spindle lead)}}$$

Measuring system pulses [pulses/rev]
Displacement [mm/rev measuring system or degrees/rev measuring system]

Important: The minimum measuring system resolution or traversing distance is 1/1000 mm or 1/1000 degrees.
The CC 10 may not be able to process lower resolutions, e.g. 5/10000 mm (owing to dependence on speed, closed loop gain factor, display).

Example 1: The measuring system has 2,500 pulses/rev. and is mounted directly on the motor shaft. The spindle lead is 10 mm/rev. and there is no transfer gear between the motor and spindle. This means that the linear axis travels by 10 mm per 1 motor revolution.

$$P0200 = \frac{\text{Measuring syst. pulses x 4 (four–fold eval.)}}{\text{Displacement}}$$

$$P0200 = \frac{\text{2500 pulses/rev. x 4}}{\text{10 mm/rev.}}$$

$$P0200 = \frac{\text{10000 pulses}}{\text{10 mm}}$$

$$P0200 = \text{1000 pulses/mm}$$

⟶ The smallest traversable unit is:

$$= \frac{1}{1000}\ \text{mm}$$

$$= 0.001\ \text{mm}$$

The pulses (here for axis X01 = 2500) are quadrupled in the control (—> 10,000 pulses/encoder revolution). The number of encoder lines determines the resolution or measuring system evaluation (P0200) in conjunction with the spindle lead (and any transfer gear).

Example 2: A rotary axis is equipped with a measuring system with 360 pulses/revolution. The measuring system is mounted directly on the motor shaft. Owing to a gear with a transfer ratio of 2:1, 2 motor revolutions are required in order to travel the rotary table by 360°; i.e. the rotary table travels by 180° per 1 motor or measuring system revolution.

$$P0200 = \frac{\text{Measuring syst. pulses x 4 (four–fold eval.)}}{\text{Displacement}}$$

$$P0200 = \frac{\text{360 pulses/rev. x 4}}{\text{180 degrees/rev.}}$$

$$P0200 = \frac{\text{1440 pulses/rev.}}{\text{180 degrees/rev.}}$$

$$P0200 = \text{8 pulses/degree}$$

⟶ The minimum traversable unit is:

$$= \frac{1}{8}\ \text{degrees}$$

$$= 0.125\ \text{degrees}$$

Example 3: A linear axis is equipped with an absolute measuring system. The traversing distance of the axis is 1 m. The minimum programmable displacement or resolution should be at least 0.01 mm, i.e. 100 pulses/mm. The spindle lead is 5 mm/rev.

Encoder selection:
The traversing distance and spindle lead determine the number of revolutions which the absolute measuring system must possess in order to supply absolute values over the whole traversing range (1 m).

$$P0204' = \frac{\text{Total traversing range}}{\text{Spindle lead}} = \frac{1000\ \text{mm}}{5\ \text{mm}}$$

$$P0204' = 200$$

An encoder with 512 revolutions is selected from the product range of a measuring system supplier.

$$P0200' = \frac{\text{Measuring syst. pulses}}{\text{Displacement (spindle lead)}} = \frac{P0202'}{\text{Displacement (spindle lead)}}$$

$$P0202' = P0200 \cdot \text{Displacement (spindle lead)}$$

$$P0202' = 100\ \frac{\text{pulses}}{\text{mm}} \cdot 5\ \text{mm}$$

$$P0202' = 500\ \text{pulses}$$

An encoder with 1024 measuring steps per revolution is selected from the product range of a measuring system supplier.

Determination of parameters:
Parameters P0200, P0202, P0204 can now be determined on the basis of the minimum requirements with respect to resolution and the given values

Traversing distance	= 1 m
Spindle lead	= 5 mm
Number of encoder revolutions	= 512
Measuring steps of encoder/resolution	= 1024.

P0202 = 1024 measuring steps/resolution (pulses/rev.)

P0204 = 512 revolutions

$$P0200 = \frac{P0202}{\text{Displacement (spindle lead)}}$$

$$P0200 = \frac{1024\ \frac{\text{pulses}}{\text{rev.}}}{5\ \frac{\text{mm}}{\text{rev.}}}$$

$$P0200 = 204{,}8\ \frac{\text{pulses}}{\text{mm}}$$

Example 4: A rotary axis is to be equipped with a multi–turn absolute encoder. The desired resolution or minimum programmable displacement is 0.01 degrees, i.e. 100 pulses/degree.

Important:
The parameter P0200 is determined in different ways, depending on whether a single–turn encoder or a multi–turn encoder is used.

Multi–turn encoder

P0202 $\hat{=}$ Measuring steps/rev.

P0204 $\hat{=}$ Number of revolutions

$$\text{P0200} = \frac{\text{Measuring syst. pulses}}{360^\circ} = \frac{\text{P0202} \cdot \text{P0204}}{360^\circ}$$

Single–turn encoder

$$\text{P0200} = \frac{\text{Measuring syst. pulses}}{360^\circ} = \frac{\text{P0202}}{360^\circ}$$

Encoder selection

$$\text{P0200} = \frac{\text{Measuring syst. pulses}}{360^\circ} = \frac{\text{P0202} \cdot \text{P0204}}{360^\circ}$$

$$\text{P0202} \cdot \text{P0204} = \text{P0200} \cdot 360^\circ$$

$$\text{P0202} \cdot \text{P0204} = 100 \text{ pulses} \cdot 360^\circ$$

$$\text{P0202} \cdot \text{P0204} = 36000 \text{ pulses (measuring steps)}$$

An encoder with 256 revolutions and 512 measuring steps/rev. is selected from the product range of a measuring system supplier.

Parameter determination:

P0202 = 512 measuring steps/rev. (meas. pulses/rev.)

P0204 = 256 revolutions

$$\text{P0200} = \frac{\text{Measuring syst. pulses}}{360^\circ} = \frac{\text{P0202} \cdot \text{P0204}}{360^\circ}$$

$$\text{P0200} = \frac{512 \, \frac{\text{pulses}}{\text{rev.}} \cdot 256}{360^\circ}$$

$$\text{P0200} = 364{,}09$$

[P0201] [X01=] [X02=] [X03=]	ENCODER SELECTION [1] [1] [2]	Definition of measuring system type: [1] Revolution–coded incremental encoder (type TE 60). This encoder can be used only in conjunction with linear axes. [2] Incremental rotary encoder, e.g. ROD 428 [3] Linear scale, e.g. LS703, LS704 [4] Absolute encoder, e.g. AG66 SSI
[P0202] [X01=] [X02=] [X03=]	NUMBER OF ENCODER PULSES [2500] [2500] [1000] Value range: 1 – 99999	The number of pulses per encoder revolution is specified for each axis in parameter P0202. The value indicated on the encoder rating plate must be entered. The number of pulses is required internally by the control for monitoring of the incremental measuring system. In the case of absolute measuring systems, this parameter determines the maximum traversing range as well as the measuring system evaluation factor (see parameter P0200, Example 4) in conjunction with parameter P0202.
[P0203] [X01=] [X02=] [X03=]	NOMINAL ROTATION [1024] [1024] [1024] Value range: 1 – 2048	Applies in combination with machine parameter P0201. If a revolution–coded incremental encoder (1) is applied in P0201, the maximum number of encoder revolutions must be defined in P0203. The encoder type TE60 can perform 1024 revolutions in one direction before the coding is repeated.
[P0204] [X01=] [X02=] [X03=]	ABS. ENC. TURN [4096] [4096] [4096] Value range: max. 4096	The number of revolutions is defined with P0204 in conjunction with a multi–turn absolute encoder. Only values with a base of 2 are permitted. The value [1] must be defined for the corresponding axis in the case of single–turn absolute encoders.

[P0205] CODE ABS. ENCODER
[X01=] [1] GRAY CODE
[X02=] [1] GRAY CODE
[X03=] [1] GRAY CODE

The absolute encoder can be coded in GRAY or BINARY CODE.
[0] BINARY CODE
[1] GRAY CODE

[P0206] DOUBLE CHECK
[X01=] [1] YES
[X02=] [1] YES
[X03=] [1] YES

Double polling (only in conjunction with absolute value encoders) increases the safety of data transfer from the encoder to the CC 10 (refer to ”Interface conditions”)
[0] = No double polling
[1] = Double polling

[P0207] MONITOR RANGE
[X01=] [10.000]
[X02=] [10.000]
[X03=] [10.000]
Value range:
0 – 100 mm

Two additional monitoring functions of the control loop can be activated by the user if required independently of the control loop monitoring functions which are always active (e.g. servo error, measuring system loss). These monitoring functions are defined with the parameters P0207, P0208 and P0209. If the value [0] is entered in [P0207], the monitoring functions described in 1 and 2 are inactive.

1. Axis at standstill (no traversing command)
A displacement is entered in parameter P0207. The monitoring function responds when the ACTUAL POSITION of the axis deviates from the setpoint position (> P207) within a defined period.
The period is set with parameter P0209.

2. Axis in motion (traversing command present)
A traversing command is present, initiated by manual traversing (MAN+) or by starting an NC program. If the axis does not execute a movement within a defined period, the monitoring function responds.
The period is defined in P0208.

The READY contact (X10, CC 10 front panel) is opened if one of the two monitoring functions responds.

[P0208] MONITOR TIME 1
[X01=] [500]
[X02=] [500]
[X03=] [500]
Value range:
100 ms – 32767 ms

Monitoring time for ”axis in motion”, refer to description P0207.

[P0209] [X01=] [X02=] [X03=]	MONITOR TIME 2 [1000] [1000] [1000] Value range: 100 ms – 32767 ms	Monitoring time for ”axis at standstill”, refer to description of P0207
[P0210] [X01=] [X02=] [X03=]	LOWER LIMIT SWITCH [–5000.000] [–5000.000] [–9999.999] Value range: 0 – +/– 99999.999	Specifies the axis–specific dimensions for the lower software limit switches [measured in mm]. **Important**: The software limit switches depend on the maximum permissible number of revolutions (P0203 or P0204) of the encoder when using revolution–coded incremental encoders and absolute rotary encoders. The software limit switches cannot become active until the reference point has been approached for the first time (does not apply to absolute measuring systems). The value entered here must lie within the available traversing range of the machine. It must also be noted that this value must be calculated in combination with the resolution (parameter P0200). **Note**: In the case of revolution–coded incremental encoders and for absolute measuring systems, the difference between P210 and P220 must be less than the maximum traversing range of the encoder. Permissible traversing range for incremental measuring systems [mm]: $\left(\frac{P202 \text{ x } P203 \text{ x } 4}{P200}\right) -1$ Permissible traversing range for absolute measuring systems [mm]: $\left(\frac{P0202 \text{ x } P0204}{P200}\right) -1$
[P0220] [X01=] [X02=] [X03=]	UPPER LIMIT SWITCH [+5000.000] [+5000.000] [+9999.999] Value range: 0 – +/– 99999.999	Specification of the axis–specific dimensions for the upper software limit switches (also refer to parameter P0210).

[P0230]	REF. POSITION	Offset of the reference point position (zero pulse) relative to the machine zero point.
[X01=]	[.000]	
[X02=]	[.000]	
[X03=]	[.000]	
	Value range: 0 – +/– 99999.999	

Parameter P230 can be used to specify the offset of the reference point position (zero pulse of rotary encoder) relative to the machine zero point in order to avoid mechanical adjustment of the rotary encoder.

The following procedure is suggested for calculating the values for P230 when using a revolution–coded incremental rotary encoder TE60 (Messrs. Stegmann).

1. Enter a ”provisional” reference point position in parameter P230 for the axis in which the rotary encoder TE60 is used.

$$P230_1 = \frac{P220 + P210}{2}$$

$P230_1$	=	Provisional reference point position
P220	=	Upper software limit switch
P210	=	Lower software limit switch

Enter this value and then start a ”run–up” (restart) of the CC 10.

2. Set the axis to roughly the middle of the traversing range and start the function ”approach reference point” for the axis concerned.
If the encoder has been connected as specified in the interface conditions and the appropriate enable signals are present at the interface, the axis will find a reference point and synchronize with this point within one encoder revolution.

3. Travel the axis to a machine position whose numerical value in the coordinate system is known to you in ”Manual” mode. This position is referred to below as

$P_{set.}$ = Numerical value of the machine reference point.

Make a note of the position which is now shown in the display of the BPF10. This value is referred to below as POS_1 = displayed position.

4. Determine the value for P230 in accordance with the following equation.

$P230 = (P230_1) + (P_{set.}) - (POS_1)$
(All values must be calculated with the correct sign)

Numerical example:

$P230_1$ = – 500 mm
$P_{set.}$ = – 100 m
POS_1 = – 300 mm

P230 = – 500 mm – 100 mm + 300 mm
P230 = **– 300 mm**

Enter this value and start a ”run–up” (restart) of the CC 10.

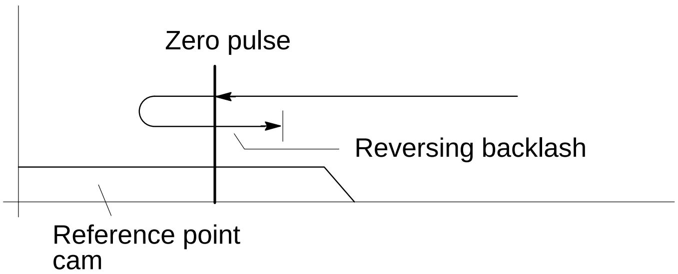
5. The absolute machine position defined by you is displayed after execution of the function ”approach reference point”. The software limit switches refer themselves to this position.

6. **Note**: The value in parameter P0230 specifies the distance of the machine zero point from the ”encoder zero point” in conjunction with absolute encoders.

[P0231] [X01=] [X02=] [X03=]	REF. POINT OFFSET [.000] [.000] [.000] Value range:	In the case of controls with incremental measuring systems, the axes must be traveled to the reference point after switching on. Parameter P0231 can be used to define an axis–specific displacement which the axis must travel to reach the actual machine zero point after synchronization with the measuring system pulse. The value entered must be > 0 and > reversing backlash.
[P0240] [X01=] [X02=] [X03=]	INPOS RANGE [.020] [.020] [.020] Value range: 0 – 10.000	The axis–specific interface signal INPOSITION is output as long as the axis is located in this window [mm] or [degrees] and ACTUAL POSITION = SETPOINT POSITION (refer to ”Interface Conditions”, digital interface).
[P0250] [X01=] [X02=] [X03=]	OFFSET [.000] [.000] [.000] Value range: – 99.999 – + 99.999	The offsets of the analog setpoint output voltage can be compensated by means of parameter P0250.
[P0260] [X01=] [X02=] [X03=]	DIRECTION M.S [1] POSITIVE [1] POSITIVE [0] NEGATIVE	Parameter P0260 is used to reverse the sign for the setpoint output voltage; in this way, it is possible to prevent positive feedback in the position control loop without having to rewire the setpoint. 0 = Negative output voltage 1 = Positive output voltage
[P0261] [X01=] [X02=] [X03=]	COORDINATE DIR [0] NEGATIVE [0] NEGATIVE [0] NEGATIVE	Definition of the coordinate system: 0 = Negative direction of rotation 1 = Positive direction of rotation

[P0270]	BACKLASH COMP.
[X01=]	[0.000]
[X02=]	[0.000]
[X03=]	[0.000]
	Value range:
	0 – 10.000 mm

The reversing backlash is the value which does not result in any mechanical movement in the measuring system after a change in the spindle's direction of rotation or reversal of the direction on the gear rack. The numerical value in P0207 is in units of [mm] or [degrees], depending on the axis in question. The reversing backlash is offset only for axes with an incremental measuring system (exception: offset of the reversing backlash is not possible for rotary axes which are not programmed in degrees but in revolutions).
The reversing backlash is not offset in conjunction with revolution–coded rotary encoders or absolute encoders.
The value of the reversing backlash must be determined by the user. The backlash is offset for the first time in the CC 10 after the axis has synchronized with the zero pulse of the measuring system after switching on.



AXIS DYNAMIC

[P0300]	MAX. SPEED AXIS
[X01=]	[12.000]
[X02=]	[12.000]
[X03=]	[12.000]
	Value range:
	0 – 999999.99

Specification of the maximum axis speed (rapid traverse speed), unit m/min. An analog setpoint voltage of +/– 10 V is output at this speed. Output resolution (setpoint step-change/position servo clock): 0.402 mV.

If a rotary axis has been defined in parameter P0110, the speed is specified in the units DEGREES/min.

Note: The speed can be freely selected within limits. The limits are determined by the format 6.2 and by the selected resolution (P0200).

The following guideline applies in conjunction with absolute measuring systems:

$$\text{max. axis speed} \left[\frac{\text{degrees}}{\text{min}}\right] \cdot \text{Sampling time [ms]} < 180¿$$

$$\hat{=} \; (\text{P300} \cdot \text{P021} < 180¿)$$

General rule:
Max. axis speed
¿ 24 m/min for P0200 = 1000 pulses/mm
or
24000 degrees/min for P0200 = 1000 pulses/degree
i.e.
the value for the max. axis speed can increase proportionally within the format 6.2 if the value for parameter P0200 is less than 1000 pulses/mm or 1000ÿpulses/degree.

Example 1:

The parameter P0200 = 100 pulses/mm is defined for a linear axis; in other words, the smallest displacement possible is 0.01 mm.
The axis is to be traversed at a speed of 120 m/min.

$$P0300_{\text{set.}} = 120 \; \frac{\text{m}}{\text{min}}$$

Limit values:

1.

$$P300_{\text{max}} = 24 \; \frac{\text{m}}{\text{min}} \cdot \frac{\text{1000 pulses/min}}{\text{100 pulses/min}}$$

$$P300_{\text{max}} = 240 \; \frac{\text{m}}{\text{min}}$$

$$\longrightarrow 120 \; \frac{\text{m}}{\text{min}} < 240 \; \frac{\text{m}}{\text{min}}$$

2. The format 6.2 must not be exceeded, i.e. the theoretical speed is 999999.99 m/min

$$\longrightarrow 120 \; \frac{\text{m}}{\text{min}} < 999999.99 \; \frac{\text{m}}{\text{min}}$$

On the basis of the limit value calculations performed, the max. axis speed can be defined at 120 m/min.

Example 2:

A rotary axis is to be traversed at 2500 rev/min.
Parameter P0200 = 10 pulses/degree, i.e. the smallest possible displacement is 0.1 degrees.

$$P0300_{set.} = 2500 \ \frac{rev}{min} \cdot 360 \ \frac{degrees}{rev}$$

$$P0300_{set.} = 900000 \ \frac{degrees}{min}$$

Limit values:

1. $P0300_{max} = 24000 \ \frac{degrees}{min} \cdot \frac{1000 \ pulses/degree}{10 \ pulses/degree}$

   $P0300_{max} = 2400000 \ \frac{degrees}{min}$

   $\longrightarrow 900000 \ \frac{degrees}{min} < 2400000 \ \frac{degrees}{min}$

2. The format 6.2 must not be exceeded, i.e. the maximum speed which can be defined for a rotary axis is 999999.99 degrees/min

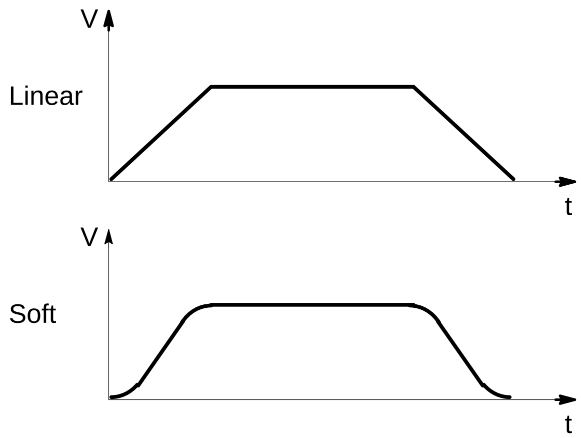
   $\longrightarrow 900000 \ \frac{degrees}{min} < 999999.99 \ \frac{degrees}{min}$

   On the basis of the limit value calculations performed, it is possible to define a maximum axis speed of 900000 degrees/min for the rotary axis.

[P0301] [X01=] [X02=] [X03=]	REF. SPEED [0.500] [0.500] [0.500] Value range: 1 – 99999.999	The speed for approach to the reference point can be set for each individual axis. The unit of measurement is m/min or degrees/min, depending on parameter P0110. Also refer to the description for P0300.
[P0302] [X01=] [X02=] [X03=]	MAX. IP SPEED [1.000] [1.000] [1.000] Value range:	This parameter is active only for controls with the option ”Interpolation”. Setpoint input takes place in step form for interpolation G01, G02 or G03 (with slope for G0). The maximum axis–specific speed [m/min.] which the axis can withstand with step–type setpoint input without the machine being damaged is defined in parameter P0302. When the part program is executed, the control then internally restricts the path speed so that the speeds of the individual axes do not exceed the values in parameter P0302.

[P0310] G0 ACCELERATION
[X01=] [1] LINEAR
[X02=] [1] LINEAR
[X03=] [2] SOFT

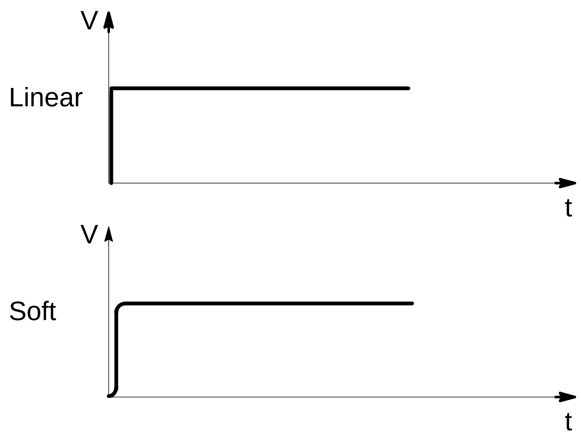
Setpoint input is performed by means of a setpoint ramp for all axis movements except for the interpolation modes G01, G02 or G03.
The setpoint ramp may be linear or soft as a result of rounding at the speed transitions.



Rounding for soft acceleration can be set by means of the parameters P0360 ... P0369.
1 = LINEAR
2 = SOFT

[P0311] IP ACCELERATION
[1] STEP

Setpoint input takes place in the form of a step for interpolation modes G01, G02 or G03. The step–type setpoint input can be rounded or softened at the speed transitions.



Rounding for ”soft” step input can be set by means of parameters P0370 ... P0379.
1 = STEP
2 = SOFT

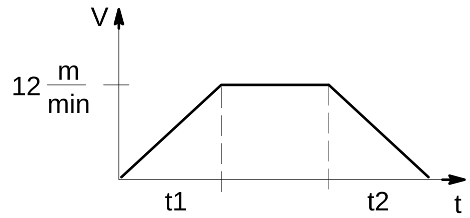
Important:
”Soft” step input for interpolation is not equivalent to a ”G01 slope” as used in the Bosch CC controls CC 220 and CC 320.

[P0320]	ACCELERATION	The linear acceleration ramp is set with parameter P0320. Different values can be set for the acceleration and braking ramps. The braking ramp is defined with parameter P0321.
[X01=]	[1.000]	
[X02=]	[1.000]	
[X03=]	[1.000]	
	Value range: 0.01 – 10000.000	

The unit of measure for linear axes is m/s^2.
The unit of measure for rotary axes is $degrees/s^2 \cdot 10^3$.

Example 1:

A linear axis is to accelerate to a rapid traverse speed of 12 m/min in t1 = 200 ms.



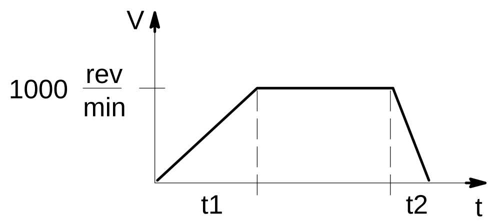
$$a = \frac{v}{t1}$$

$$a = \frac{12\ m}{60\ s \cdot 0{,}2\ s}$$

$$a = 1.000\ \frac{m}{s^2}$$

Example 2:

A rotary axis is to accelerate to 1000 rpm in t1 = 150 ms.



$$a = \frac{v}{t1}$$

$$a = \frac{1000\ rev \cdot 360\ degrees}{60\ s \cdot 0{,}15\ s \cdot rev}$$

$$a = 40000\ \frac{degrees}{s^2}$$

$$a = 40 \cdot 10^3\ \frac{degrees}{s^2}$$

Input: P0320 = 40.000

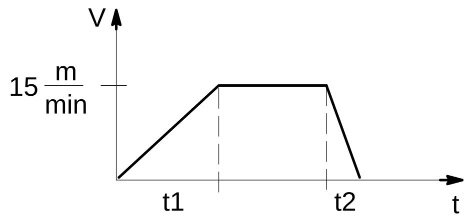
[P0321] DECELERATION
[X01=] [0.500]
[X02=] [1.000]
[X03=] [0.800]
Value range
0.01 – 10000.000

The linear braking ramp is set with parameter P0321. Different values can be set for the acceleration and braking ramps. The acceleration ramp is defined with parameter P0320.

The unit of measure for linear axes is m/s^2.
The unit of measure for rotary axes is degrees/s$^2 \cdot 10^3$.

Example 1:

A linear axis is to be braked from a rapid traverse speed of 15 m/min. to standstill in t2 = 50 ms.



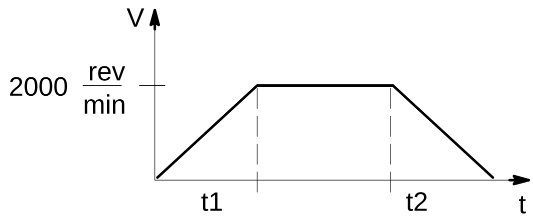
$$a = \frac{v}{t2}$$

$$a = \frac{15\ m}{60\ s \cdot 0{,}05\ s}$$

$$a = 5\ \frac{m}{s^2}$$

Example 2:

A rotary axis is to be braked from 2000 rpm to standstill in t2 = 75 ms.



$$a = \frac{v}{t2}$$

$$a = \frac{2000\ rev \cdot 360\ degrees}{60\ s \cdot 0{,}075\ s \cdot rev}$$

$$a = 160000\ \frac{degrees}{s^2}$$

$$a = 160 \cdot 10^3\ \frac{degrees}{s^2}$$

Input: P0321 = 40.000

[P0330] KV FACTOR
[X01=] [1.0]
[X02=] [1.0]
[X03=] [1.0]
Value range: 0.1 – 99

The KV (closed loop gain) factor determines the loop gain in the position control loop.

$$\text{KV–factor} = \frac{\text{Speed [m/min]}}{\text{Lag [m]}}$$

$$\longrightarrow \text{Lag} = \frac{\text{Speed [m/min]}}{\text{KV–factor}}$$

Example:
Rapid traverse speed is 12 m/min. The closed loop gain factor is to be

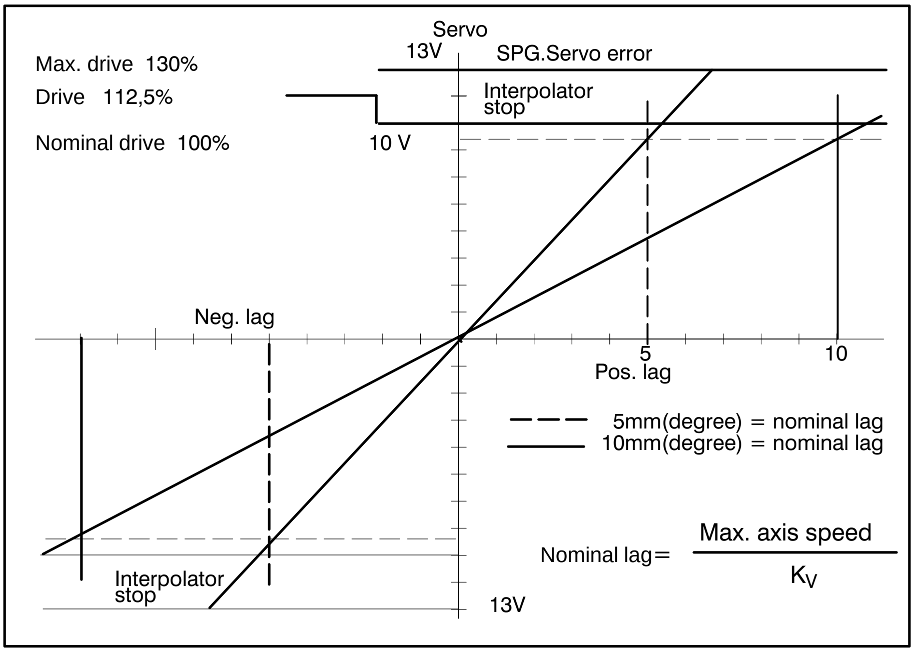
$$1{,}2 \ \frac{\mathrm{m}}{\mathrm{min} \cdot \mathrm{mm}}$$

$$\text{Lag} = \frac{12 \ \frac{\mathrm{m}}{\mathrm{min}}}{1{,}2 \ \frac{\mathrm{m}}{\mathrm{min} \cdot \mathrm{mm}}} = 10 \text{ mm}$$

When the max. lag (130%) is exceeded, the message ”**Servo error**” appears.

When the speed reaches 112% of the nominal rate, the message ”**Interpolator stop**” appears.

Diagram



[P0340] REF. POINT DIRECTION
[X01] [0] NEGATIVE
[X02] [0] NEGATIVE
[X03] [0] NEGATIVE

Parameter P0340 defines the direction in which a reference point is to be approached after switching on the control system.
0 = Negative direction
1 = Positive direction

[P0350]	IN F. % FMAX	The axis speed can be influenced via the digital interface (refer to ”Interface conditions”). The following steps are available as standard:
[X01=]	[10]	100 %
[X02=]	[10]	50 %
[X03=]	[10]	25 %
	Value range: 1 – 99	In addition to these three steps, it is possible to define a 4th step in parameter P0350 (1 – 99 % of rapid traverse speed), e.g. 10 = 10 %.

[P0360]	G0 SOFT ACC. 1	The parameters P0360 to P0369 are relevant only if ”Soft acceleration” is defined in parameter P0310. The speed transitions are rounded if ”Soft acceleration” is active. Rounding can be defined with a maximum of 10 steps, namely parameters P0360 to P0369. Default values are assigned to 5 steps for standard applications when the control is delivered. This setting permits soft or jerk–free acceleration and deceleration for non–critical axes. However, if this presetting should not be sufficient, it is possible to perform axis–specific setting on the basis of the example below.
[X01=]	[5]	
[X02=]	[5]	
[X03=]	[5]	
.		
.		
.		
.		
[P0369]	G0 SOFT ACC. 10	
	Value range: 1 – 1000	

Mode of operation and setting of soft acceleration:
An acceleration value is defined for the linear setpoint input referred to rapid traverse speed (P0320).

Example:
For V = 12 m/min. rapid traverse speed and a = 1 m/s^2 acceleration, acceleration to rapid traverse speed takes place in

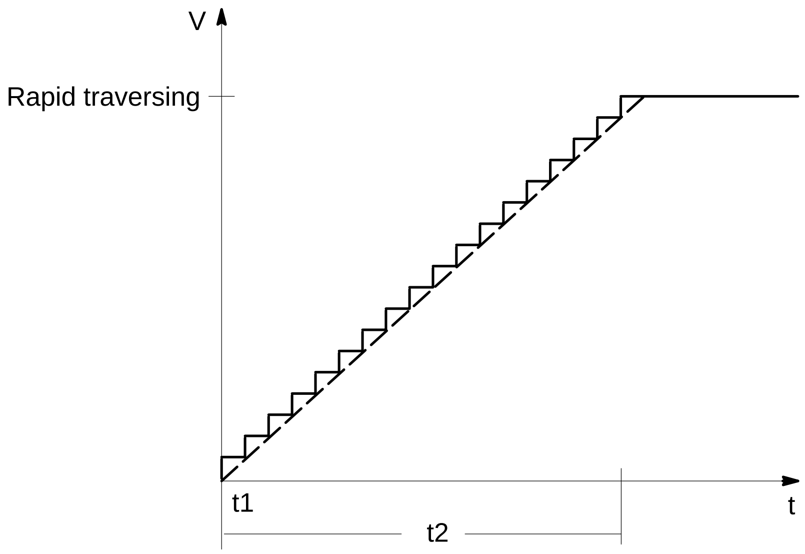
$$t = \frac{V}{a} = \frac{12 \text{ m/min}}{1 \text{ m/s}^2}$$

$$t = \frac{12 \text{ m} \;\; \text{s} \cdot \text{s}}{60 \text{ s} \;\; 1\text{m}}$$

$$\underline{\underline{t = 0{,}2 \text{ s}}}$$

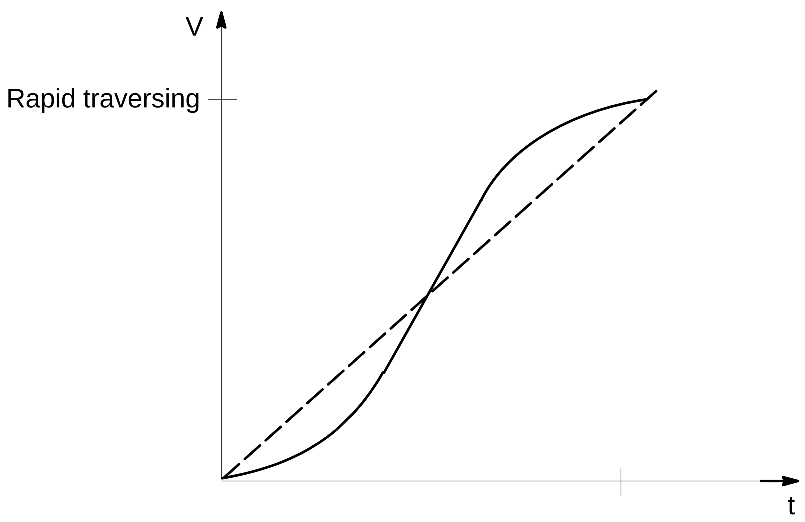
When considered exactly, the setpoint input is in reality a step–type ramp, since the setpoint value is not output continuously but in a defined time cycle with the control loop clock (sampling time).

The sampling time can be defined with parameter P0021. With a sampling time (clock) of 10.8 ms, for example, the rapid traverse speed is reached after approx. 18 clocks (18 x 10.8 ms) under ideal conditions.

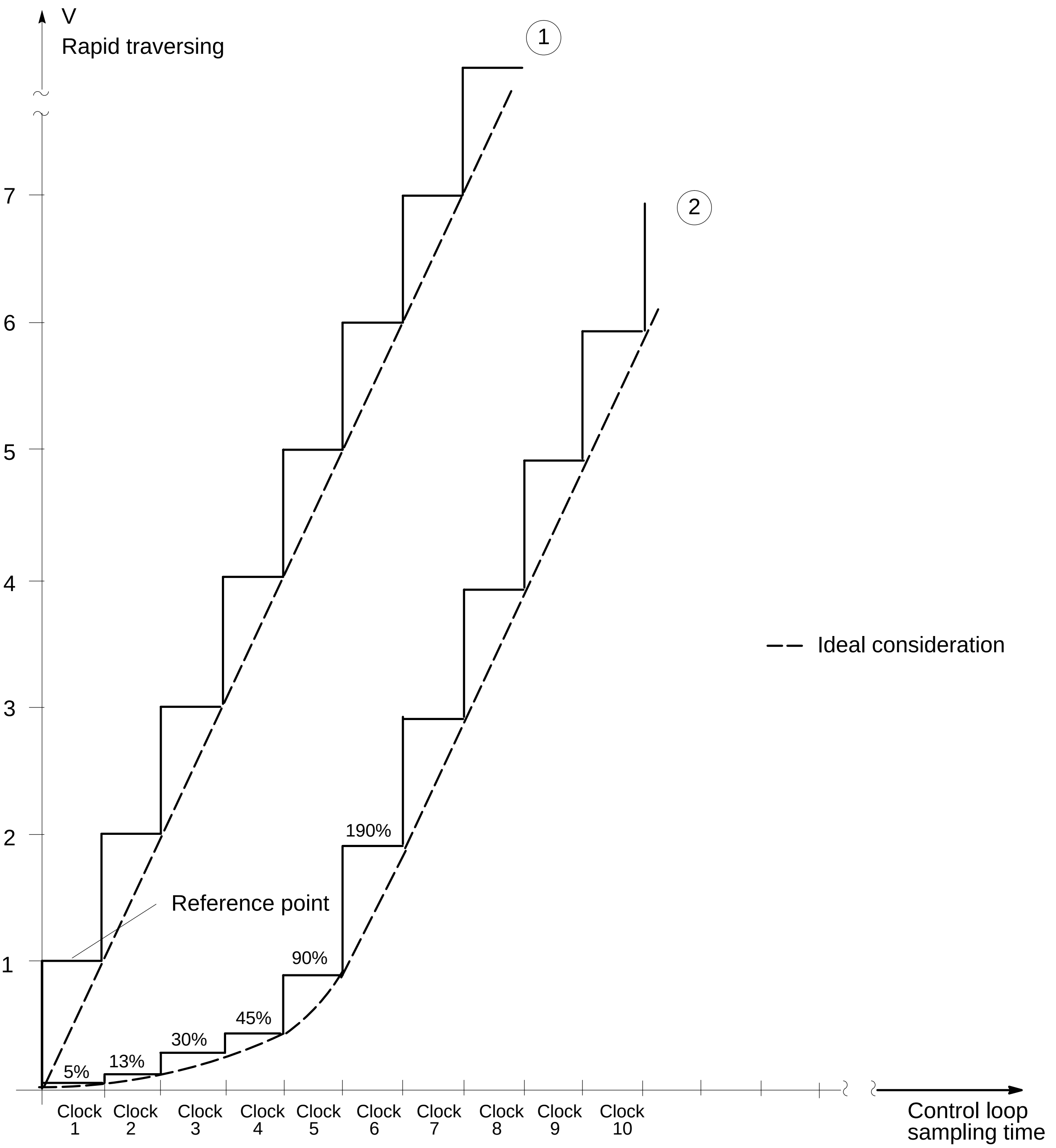


t1 ≈ 10,8 ms
t2 ≈ 200 ms

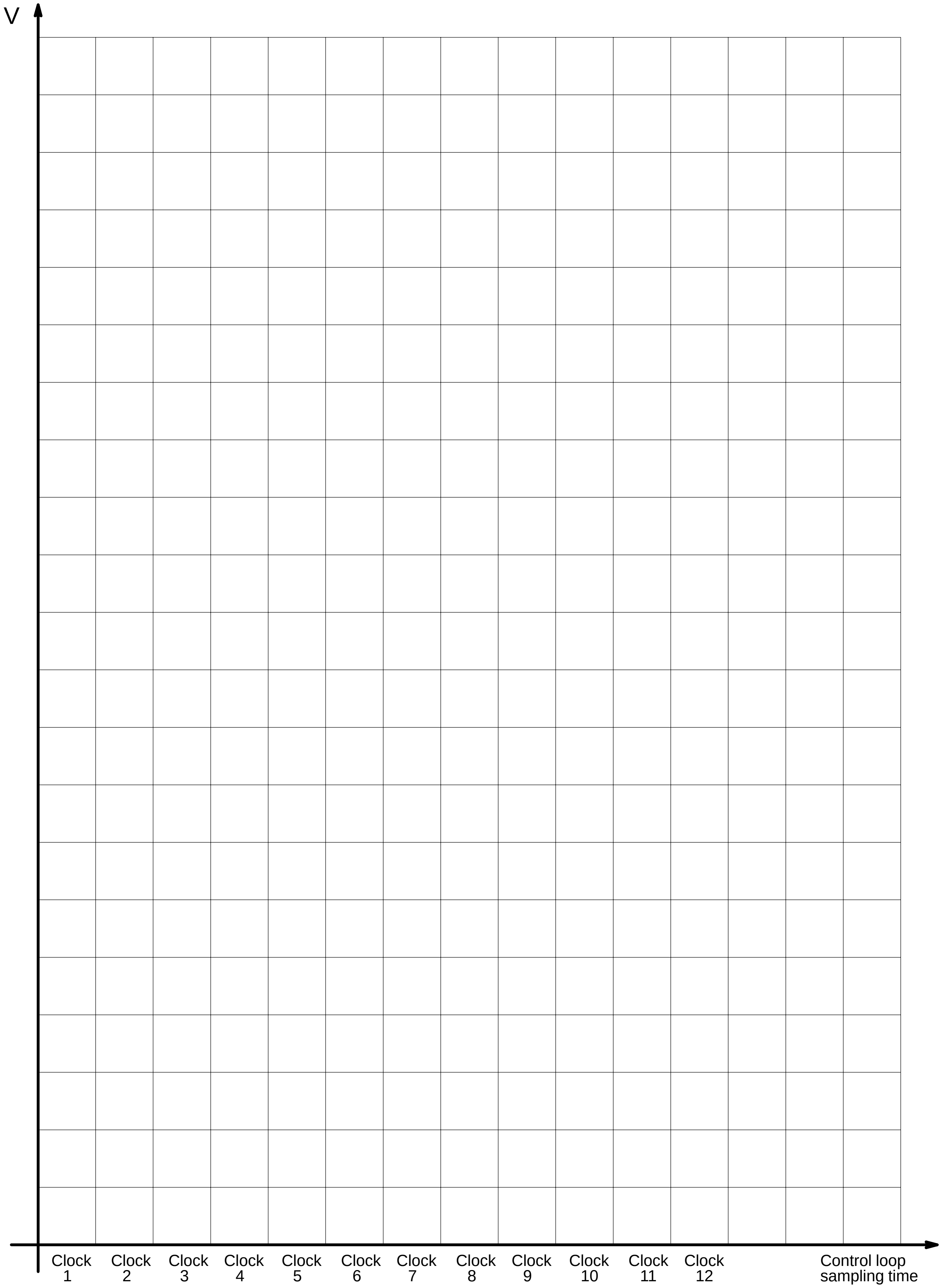
In order to achieve soft or jerk–free acceleration, it is necessary to specify smaller setpoint jumps at the start and end of the acceleration phase.
After the static friction at the start of the acceleration phase has been overcome, it is generally possible to set a steeper gradient, e.g. a = 2 m/s^2, for the middle acceleration phase.



Example:
In positioning mode (G00), it is wished to ”round” the setpoint input at the speed transitions. The control loop sampling time is 10.5 ms and the setpoint inputs are to be provided with the characteristic shown in curve 2. Curve 1 represents the characteristic for the linear acceleration function.



User planning sheet for SMOOTH ACCELERATION



Procedure:
Curve 2 is derived from curve 1.
The setpoint step 1 of curve 1 is the reference point (100 %) for setpoint damping in curve 2. In order to achieve the characteristic as shown in curve 2, the setpoint input must be only around 5 % compared with the setpoint value from curve 1. This is entered in machine parameter
P0360 [5] (≙ 5 %) correspondingly.

In control loop clock cycle 2, the setpoint output must be only approx. 13 % compared with reference point 1. This is entered in machine parameter
P0361 [13] (≙ 13 %) correspondingly.

The input for control loop clock cycle 3 is thus
P0362 [30] (≙ 30 %),

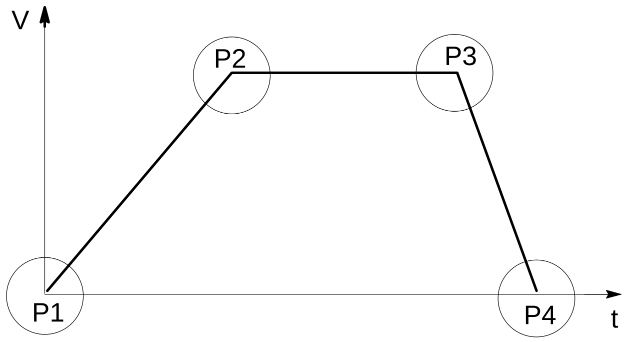
the input for control loop clock cycle 4 is
P0363 [45] (≙ 45 %)

and the input for control loop clock cycle 5 is
P0364 [90] (≙ 90 %).

Important:
Input has been completed correctly if the difference between two parameters is 100 %.
In this example, it is thus necessary to make the following input in parameter
P0365 [190] (≙ 190 % compared with reference point 1).

[0] is entered in parameters P0366 to P0369, because no further damping of the setpoint value takes place.

The effect of these 5 steps applies to all speed transitions (P1–P4) in this example.

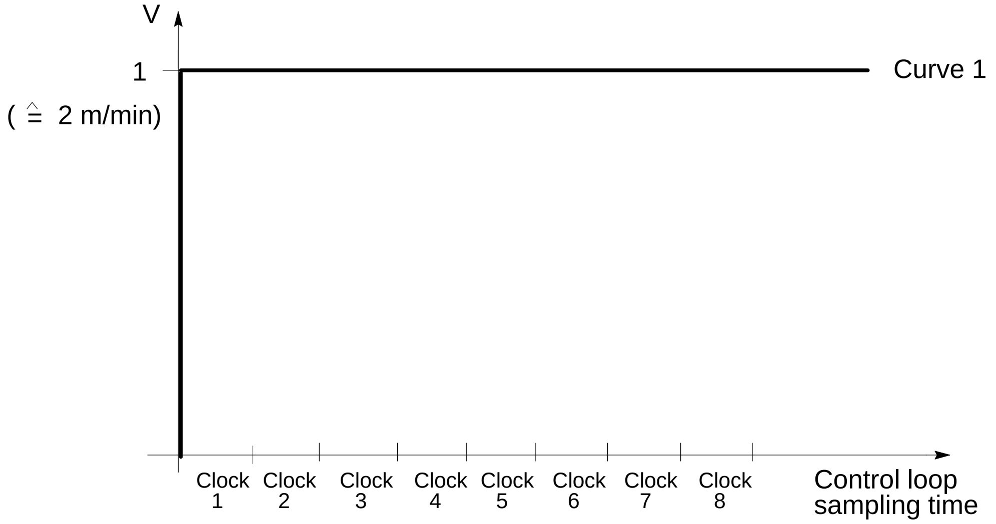


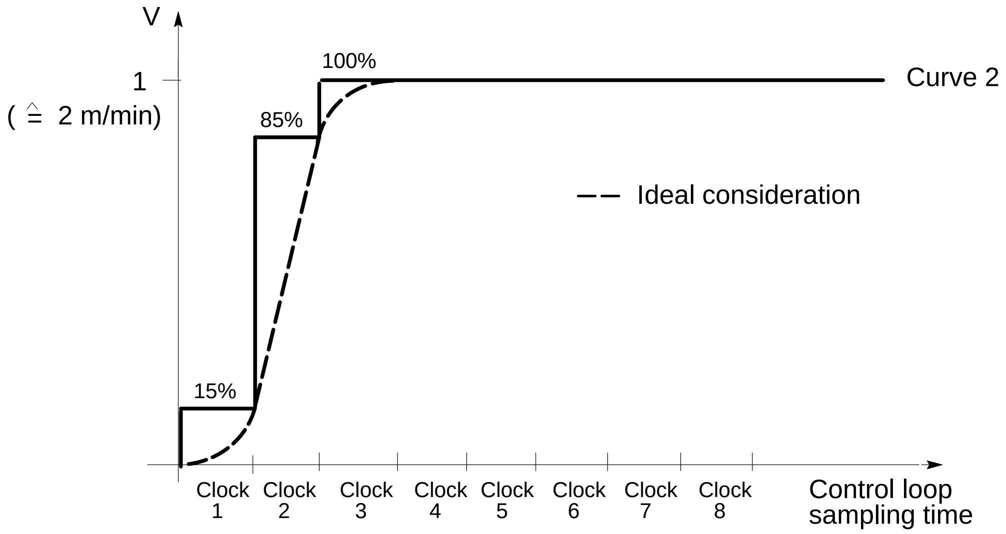
[P0370] IP SOFT ACC. 1
[5]
.
.
.
.
[P0379] IP SOFT ACC. 10
Value range:
1 – 100

The parameters P0370 to P0379 are relevant only if ”Soft acceleration” is defined in parameter P0311. Whereas the values for soft acceleration were set separately for each axis in G0 mode, the parameters P0370 to P0379 influence the path speed; for this reason, only one value must be set per step. As for parameters P0360 to P0369, values are also defined in the control at the works for these parameters as well which cover the large majority of applications as the standard setting. However, if this setting is not sufficient, the individual steps can be set in essentially the same way as described for parameter P0360.

However, setpoint input for interpolation is not in accordance with a linear function (linear slope) but by means of a step function.

Example:
The rapid traverse speed of the axis is 20 m/min. (P300).
The step response of the axis is 2 m/min. (P0302).





Procedure:
Curve 2 is derived from curve 1 with the reference point 1 (2 m/min.). Setpoint output is restricted to 15 % in the first control loop clock cycle, to 85 % in the second control loop clock cycle and to 100 % in the third control loop clock cycle.

This results in the following parameter definition:

[P0370]	[15]
[P0371]	[85]
[P0372]	[100]
[P0373]	[0]
.	.
.	.
[P0379]	[0]

The value [0] must be entered in the steps which are not used.

AUXILIARY FUNCTIONS

[P0400] [X01=] [X02=] [X03=]	AUXILIARY FUNCTION ADDRESSES [MST] [MST] [MST]	When defining the addresses for the auxiliary functions, it must be ensured that the addresses do not coincide with those which have already been defined (e.g. ”F” for feed or ”R” for radius). One of the addresses must have the designation ”M”, since various M–functions are required internally in the NC system. The auxiliary functions are output to the digital interface in the order in which they are defined in parameter P0400. **Example**: [P0400] AUX FUNC ADDR [X01=] [MST] This means that, regardless of the programming order, the – M–function is output first in the NC block, followed by the – S–function and then – T–function.
[P0410] [X01=] [X02=] [X03=]	AUX1 FCT [0] NO TRANSFER STOP [0] NO TRANSFER STOP [0] NO TRANSFER STOP	If auxiliary function 1 (the M–function as defined in parameter P0400) is programmed in an NC block, in conjunction with a traversing movement, parameter P410 can be used to define whether – the auxiliary function is output parallel to the traversing movement (0 = NO TRANSFER STOP), or – the auxiliary function is started first after activation of the NC block and the traversing movement started after the strobe time (1 = WITH TRANSFER STOP).
[P0411]	AUX2 FCT. O/P	Applies to the 2nd auxiliary function (refer to the description for P0410).
[P0412]	AUX3 FCT. O/P	Applies to the 3rd auxiliary function (refer to the description for P0410).

[P0420] [X01=] [X02=] [X03=]	AUX STROBE 1 [100] [100] [100] Value range: 1 – 999	The interface signal ”MULTIPLE OUTPUT STROBE” remains present for auxiliary function 1 for the time defined in parameter P0420. 100 = 100 ms.
[P0421]	AUX STROBE 2	Applies to the 2nd auxiliary function (refer to the description for P0420).
[P0422]	AUX STROBE 3	Applies to the 3rd auxiliary function (refer to the description for P0420).
[P0430] [X01=] [X02=] [X03=]	SEP. TIME AUX 1 [100] [100] [100] Value range: 1 – 999	A lead/lag time can be started in conjunction with the interface signal ”MULTIPLE OUTPUT STROBE” (refer to Interface conditions). 100 = 100 ms for the lead and lag times respectively.
[P0431]	SEP. TIME AUX 2	Applies to the 2nd auxiliary function (refer to the description for P0430).
[P0432]	SEP. TIME AUX 3	Applies to the 3rd auxiliary function (refer to the description for P0430).
[P0440] [X01=] [X02=] [X03=]	STR. REC. AUX 1 [0] WITHOUT ACKNOWLEDGE [0] WITHOUT ACKNOWLEDGE [0] WITHOUT ACKNOWLEDGE	Output of auxiliary function 1 can be acknowledged via the PLC sequential program: 0 = Without acknowledge The auxiliary function programmed in the NC block is output via the interface. Execution of the program (e.g. output of further auxiliary functions) is continued automatically following expiry of the strobe time. 1 = With acknowledge The output auxiliary function **must** be acknowledged by the PLC sequential program via the interface input signal ”ACKNOWLEDGE MULTIPLE OUTPUT”. Execution of the NC program is stopped until this acknowledgement is received.

[P0441]	STR. REC. AUX 2	Applies to the 2nd auxiliary function (refer to the description for P0440).
[P0442]	STR. REC. AUX 3	Applies to the 3rd auxiliary function (refer to the description for P0440).
[P0450] [X01=] [X02=] [X03=]	NO. AUTOM. PRG [–1] [–1] [–1] Value range: 1 – 9999	A program number can be entered in parameter P0450. This part program is activated internally by the control when ❍ operating mode input takes place via the PLC (input signal I5.0 = 1) and the operating mode ”Automatic” or ”Semi–automatic” is defined by the PLC ❍ the CC 10 has run up after switching on or a ”restart” and the operating mode AUTOMATIC or SEMI–AUTOMATIC is active ❍ ”Control reset” is defined via softkey or input signal I1.7 while the program is active. The function is not active if the value –1 is entered instead of a part program number. Input of 0 is not permitted.
[P0480]	NO. CORR./AXIS [3]	The number of length offsets/axis (in the case of synchronous axes) can be varied. 1 72 length offsets available in the 1st axis. If the option ”Interpolation” is active, the active offset is always offset in the infeed axis (the infeed axis is always the axis which is not involved in interpolation owing to the selected plane). 3 3 x 24 length offsets. 24 offsets are available for each axis. 3 x 24 offsets are generally activated for asynchronous axes.

INTERFACES

[P0481]	BAUD.V24 ONL. [4800] BAUD Value range: 110 BAUD 300 BAUD 600 BAUD 1200 BAUD 2400 BAUD 4800 BAUD	Remote–controlled data transfer to an external device is possible via the V.24/20 mA interface. The functions are described in the documentation ”Remote control”. Parameters P0481 – P0486 set the configuration of **the V.24/20 mA interface in ON line mode**. The BAUD rate is defined with P0481.
[P0482]	CL. V24 ONL. [0] 7 BITS	The character length may be 7 bits or 8 bits [0] 7 bits [1] 8 bits
[P0483]	PARI. V24 ONL. [1] EVEN PARITY	The characters can be provided with a parity bit. The parity bit extends the character length set in P0482 by 1 bit [0] No parity bit [1] Even parity [2] Odd parity
[P0484]	SBIT. V24 ONL. [0] 1 STOP BIT	Definition of the number of STOP bits [0] 1 STOP BIT [1] 1.5 STOP BITS [2] 2 STOP BITS
[P0485]	HMODE. V24 ONL. [0] NO HANDSHAKE	Data transfer can take place with a hardware or software handshake [0] No handshake [1] Hardware handshake [2] Software handshake
[P0486]	ECODE V24 ONL. [0] NO	In order to increase data transfer reliability, it is possible to provide each NC block with a checksum, the E–code. (Refer to the programming instructions for ”E–code”). [0] NO No E–code [1] YES E–code

[P0491]	INTERF. MODE [0] OFF LINE	Data transfer CC 10 <——> ext. device can take place in different ways. ❍ [OFF LINE] Via V.24/20 mA interface, manual operation via BPF10 ❍ [ON LINE V24] Via V.24/20 mA interface, remote control (refer to description ”Remote control”) ❍ [ON LINE PLC] Via interface data channel input and data channel output [0] OFF LINE [1] ON LINE V24 [2] ON LINE PLC The interface which was defined in parameter P0491 is active after system run–up.
[P0492]	BAUDR. V24 OFF [4800] Value range: 110 BAUD 300 BAUD 600 BAUD 1200 BAUD 2400 BAUD 4800 BAUD	Data can be read in/out via the V.24/20 mA interface by means of manual operation on the BPF 10. The parameters P0492–P0497 determine the configuration of the interface in OFF LINE mode. The BAUD rate is set with P0492.
[P0493]	CL. V.24 OFF [0] 7 BITS	The character length may be 7 bits or 8 bits [0] 7 bits [1] 8 bits
[P0494]	PARI. V24 OFF [1] EVEN PARTIY	The characters can be provided with a parity bit. The parity bit extends the character length set in P0493 by 1ÿbit. [0] No parity bit [1] Even parity [2] Odd parity
[P0495]	SBIT V24 OFF [0] STOP BIT	Definition of the number of STOP bits [0] 1 stop bit [1] 1.5 stop bits [2] 2 stop bits

[P0496]	HMODE V24 OFF [0] NO HANDSHAKE	Data transfer can take place with a hardware or software handshake. [0] No handshake [1] Hardware handshake [2] Software handshake
[P0497]	ECODE V24 OFF [0] NO	In order to increase data transfer reliability, each NC block can be provided with a checksum, the E–code. (Refer to the programming instructions for ”E–code”) [0] NO No E–code [1] YES E–code

FUNCTION KEYS

[P0500] [=A2.4] FCT. KEY 01

The function keys F1 – F12 are located on the control panel BPF 10 (BPF 10 E).
These keys are intended for user functions.
Digital signals can be sent to the PLC sequential program with the function keys F1 – F12 via the user outputs 2.4 – 2.7 and 21.0 – 21.7. When one of the keys is pressed, a binary logic operation is performed until the key is released. A maximum of 5 binary logic operations can be programmed in the machine parameters for each key.
The consent key must be pressed together with the function key on the BPF 10 so that the function defined in the machine parameter is activated in the CC 10.

COMMAND	1	A	AND
COMMAND	2	NAND	NOT AND
COMMAND	3	O	OR
COMMAND	4	NOR	NOT OR
COMMAND	5	XO	EXCLUSIVE OR
COMMAND	6	XNOR	EXCLUSIVE NOT OR
COMMAND	7	S	SET
COMMAND	8	R	RESET
COMMAND	9	=	ASSIGNMENT

The commands are executed in the order in which they are input.
In the case of command strings, such as S O2.4 R O2.5 RÿO2.6, the command R O2.6 is the last instruction to be executed. For the user, this means that the entire command sequence cannot be evaluated until the last instruction has been executed, i.e. the last instruction must be evaluated in the same way as a ”strobe signal”.

Examples for possible programming of function key F1:

	[NAND	I3.1	A	I3.2	A	I3.3	A	I3.0	= O2.4]
or	[A	I3.1	XO	I3.2	=	O2.4]			
or	[A	I3.1	XON	I3.2	=	O2.4]			
or	[A	I3.1	A	I3.2	A	I3.3	O	I3.0	= O2.5]
or	[=	O2.4	=	O2.5	=	O2.6	=	O2.7]	
or	[S	O2.4	S	O2.5	S	O2.6	S	O2.7]	
or	[R	O2.4	R	O2.5	R	O2.6	R	O2.7]	
or	[S	O2.4	R	O2.5]					

Commands can be input without blanks.

Note: The assignment = and **R** or **S** for a function key are mutually exclusive.

= ~~O2.4 SO2.5~~ Not permissible

[P0501] FCT. KEY 02
↓
[P0511] FCT. KEY 12

Refer to description for [P0500] FCT. KEY 1

3. ANNEX

Machine parameters upon delivery

When the CC 10 is delivered, the FLASH–EPROMs in which the machine parameters are stored are not yet defined.
However, all machine parameters are preassigned values in the operating system.The standard machine parameters are transferred in interactive mode during the first run-up.
The values predefined in the operating system are listed below.

(DFS,L,MACHINE PARAMETER)

[P0010]	NO. OF CC10	
	[99999]	
[P0011]	LANGUAGE	
	[1]	GERMAN
[P0020]	NUMBER OF AXES	
	[3]	
[P0021]	REALTIME CLOCK	
	[5]	
[P0030]	AXIS CONFIG.	
	[0]	SYNCHRONOUS
[P0042]	EXT. INTERFACE	
	[0]	NO
[P0100]	NAME OF AXIS	
[X01=	X02=	X03=]
[P0110]	TYPE OF AXIS	
[X01=]	[0]	LINEAR AXIS
[X02=]	[0]	LINEAR AXIS
[X03=]	[0]	LINEAR AXIS

[P0111]	OPTIMUM PATH ?	
[X01=]	[0]	NO
[X02=]	[0]	NO
[X03=]	[0]	NO

[P0140]	POSITION	
[X01=]	[1]	IN DEGREES
[X02=]	[1]	IN DEGREES
[X03=]	[1]	IN DEGREES

[P0141]	MINIMUM DIST.
[X01=]	[1]
[X02=]	[1]
[X03=]	[1]

[P0150]	UNITS MEAS.	
[X01=]	[1]	PULSES/MM
[X02=]	[1]	PULSES/MM
[X03=]	[1]	PULSES/MM

[P0200]	FEEDBACK FACT
[X01=]	[1000.00]
[X02=]	[1000.00]
[X03=]	[1000.00]

[P0201]	ENC. SELECTION
[X01=]	[2]
[X02=]	[2]
[X03=]	[2]

[P0202]	# OF ENC. PULSE
[X01=]	[1000]
[X02=]	[1000]
[X03=]	[1000]

[P0203]	NOM. ROTATION
[X01=]	[1024]
[X02=]	[1024]
[X03=]	[1024]

[P0204]	ABS. ENC. TURN
[X01=]	[4096]
[X02=]	[4096]
[X03=]	[4096]

[P0205]	CODE ABS. ENC.	
[X01=]	[1]	GRAY CODE
[X02=]	[1]	GRAY CODE
[X03=]	[1]	GRAY CODE

[P0206]	DOUBLE CHECK	
[X01=]	[1]	YES
[X02=]	[1]	YES
[X03=]	[1]	YES

[P0207]	MONITOR RANGE
[X01=]	[10.000]
[X02=]	[10.000]
[X03=]	[10.000]

[P0208]	MONITOR TIME 1
[X01=]	[500]
[X02=]	[500]
[X03=]	[500]

[P0209]	MONITOR TIME 2
[X01=]	[1000]
[X02=]	[1000]
[X03=]	[1000]

[P0210]	L. LIMIT SW.
[X01=]	[–9999.999]
[X02=]	[–9999.999]
[X03=]	[–9999.999]

[P0220]	U. LIMIT SW.
[X01=]	[9999.999]
[X02=]	[9999.999]
[X03=]	[9999.999]

[P0230]	REF. POSITION
[X01=]	[0.000]
[X02=]	[0.000]
[X03=]	[0.000]

[P0231]	REF. POINT OFFSET
[X01=]	[0.000]
[X02=]	[0.000]
[X03=]	[0.000]

[P0240]	INPOS RANGE	
[X01=]	[0.010]	
[X02=]	[0.010]	
[X03=]	[0.010]	
[P0250]	OFFSET	
[X01=]	[0.000]	
[X02=]	[0.000]	
[X03=]	[0.000]	
[P0260]	DIRECTION M.S	
[X01=]	[1]	POSITIVE
[X02=]	[1]	POSITIVE
[X03=]	[1]	POSITIVE
[P0261]	COORDINATE DIR	
[X01=]	[1]	POSITIVE
[X02=]	[1]	POSITIVE
[X03=]	[1]	POSITIVE
[P0270]	BACKLASH COMP.	
[X01=]	[0.000]	
[X02=]	[0.000]	
[X03=]	[0.000]	
[P0300]	MAX. SPEED AXIS	
[X01=]	[5.000]	
[X02=]	[5.000]	
[X03=]	[5.000]	
[P0301]	REF. SPEED	
[X01=]	[0.500]	
[X02=]	[0.500]	
[X03=]	[0.500]	
[P0302]	MAX. IP SPEED	
[X01=]	[5.000]	
[X02=]	[5.000]	
[X03=]	[5.000]	
[P0310]	G0 ACCELERATION	
[X01=]	[1]	LINEAR
[X02=]	[1]	LINEAR
[X03=]	[1]	LINEAR

[P0311]	IP ACCELERATION	
	[1]	STEP
[P0320]	ACCELERATION	
[X01=]	[0.500]	
[X02=]	[0.500]	
[X03=]	[0.500]	
[P0321]	DECELERATION	
[X01=]	[0.500]	
[X02=]	[0.500]	
[X03=]	[0.500]	
[P0330]	KV FACTOR	
[X01=]	[2.5]	
[X02=]	[2.5]	
[X03=]	[2.5]	
[P0340]	REF. POINT DIR	
[X01=]	[0]	NEGATIVE
[X02=]	[0]	NEGATIVE
[X03=]	[0]	NEGATIVE
[P0350]	IN F. % FMAX	
[X01=]	[10]	
[X02=]	[10]	
[X03=]	[10]	
[P0360]	G0 SOFT ACC. 1	
[X01=]	[5]	
[X02=]	[5]	
[X03=]	[5]	
[P0361]	G0 SOFT ACC. 2	
[X01=]	[13]	
[X02=]	[13]	
[X03=]	[13]	
[P0362]	G0 SOFT ACC. 3	
[X01=]	[30]	
[X02=]	[30]	
[X03=]	[30]	

[P0363] G0 SOFT ACC. 4
[X01=] [45]
[X02=] [45]
[X03=] [45]

[P0364] G0 SOFT ACC. 5
[X01=] [145]
[X02=] [145]
[X03=] [145]

[P0365] G0 SOFT ACC. 6
[X01=] [0]
[X02=] [0]
[X03=] [0]

[P0366] G0 SOFT ACC. 7
[X01=] [0]
[X02=] [0]
[X03=] [0]

[P0367] G0 SOFT ACC. 8
[X01=] [0]
[X02=] [0]
[X03=] [0]

[P0368] G0 SOFT ACC. 9
[X01=] [0]
[X02=] [0]
[X03=] [0]

[P0369] G0 SOFT ACC. 10
[X01=] [0]
[X02=] [0]
[X03=] [0]

[P0370] IP SOFT ACC. 1
[20]

[P0371] IP SOFT ACC. 2
[40]

[P0372] IP SOFT ACC. 3
[60]

[P0373]	IP SOFT ACC. 4	
	[80]	
[P0374]	IP SOFT ACC. 5	
	[100]	
[P0375]	IP SOFT ACC. 6	
	[0]	
[P0376]	IP SOFT ACC. 7	
	[0]	
[P0377]	IP SOFT ACC. 8	
	[0]	
[P0378]	IP SOFT ACC. 9	
	[0]	
[P0379]	IP SOFT ACC. 10	
	[0]	
[P0400]	AUX FUNC ADDR	
[X01=]	[MST]	
[X02=]	[MST]	
[X03=]	[MST]	
[P0410]	AUX1 FCT	
[X01=]	[0]	NO TRANSFER STOP
[X02=]	[0]	NO TRANSFER STOP
[X03=]	[0]	NO TRANSFER STOP
[P0411]	AUX2 FCT. O/P	
[X01=]	[0]	NO TRANSFER STOP
[X02=]	[0]	NO TRANSFER STOP
[X03=]	[0]	NO TRANSFER STOP
[P0412]	AUX3 FCT. O/P	
[X01=]	[0]	NO TRANSFER STOP
[X02=]	[0]	NO TRANSFER STOP
[X03=]	[0]	NO TRANSFER STOP

[P0420]	AUX STROBE 1	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0421]	AUX STROBE 2	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0422]	AUX STROBE 3	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0430]	SEP. TIME AUX 1	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0431]	SEP. TIME AUX 2	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0432]	SEP. TIME AUX 3	
[X01=]	[100]	
[X02=]	[100]	
[X03=]	[100]	

[P0440]	STR. REC. AUX 1	
[X01=]	[0]	NO ACKNOWLEDGE
[X02=]	[0]	NO ACKNOWLEDGE
[X03=]	[0]	NO ACKNOWLEDGE

[P0441]	STR. REC. AUX 2	
[X01=]	[0]	NO ACKNOWLEDGE
[X02=]	[0]	NO ACKNOWLEDGE
[X03=]	[0]	NO ACKNOWLEDGE

[P0442]	STR. REC. AUX 3	
[X01=]	[0]	NO ACKNOWLEDGE
[X02=]	[0]	NO ACKNOWLEDGE
[X03=]	[0]	NO ACKNOWLEDGE

[P0450]	NO. AUTOM. PRG
[X01=]	[–1]
[X02=]	[–1]
[X03=]	[–1]

[P0480]	NO. CORR./AXIS	
	[3]	
[P0481]	BAUD. V24 ONL.	
	[4800] BAUD	
[P0482]	CL. V24 ONL.	
	[0]	7 BITS
[P0483]	PARI. V24 ONL.	
	[1]	EVEN PARTIY
[P0484]	SBIT V24 ONL.	
	[0]	1 STOP BIT
[P0485]	HMODE V24 ONL.	
	[0]	NO ACKNOWLEDGE
[P0486]	ECODE V24 ONL.	
	[0]	NO
[P0491]	INTERF. MODE	
	[0]	OFFLINE V24
[P0492]	BAUDR. V24 OFF	
	[300]	BAUD
[P0493]	CL. V24 OFF	
	[0]	7 BITS

[P0494] PARI. V24 OFF
[1] EVEN PARITY

[P0496] HMODE V24 OFF
[0] NO ACKNOWLEDGE

[P0497] ECODE V24 OFF
[0] NO

[P0500] FCT. KEY 01
[FUNCTION IS NOT PREASSIGNED]

[P0501] FCT. KEY 02
[FUNCTION IS NOT PREASSIGNED]

[P0502] FCT. KEY 03
[FUNCTION IS NOT PREASSIGNED]

[P0503] FCT. KEY 04
[FUNCTION IS NOT PREASSIGNED]

[P0504] FCT. KEY 05
[FUNCTION IS NOT PREASSIGNED]

[P0505] FCT. KEY 06
[FUNCTION IS NOT PREASSIGNED]

[P0506] FCT. KEY 07
[FUNCTION IS NOT PREASSIGNED]

[P0507] FCT. KEY 08
[FUNCTION IS NOT PREASSIGNED]

[P0508] FCT. KEY 09
[FUNCTION IS NOT PREASSIGNED]

[P0509] FCT. KEY 10
[FUNCTION IS NOT PREASSIGNED]

[P0510] FCT. KEY 11
[FUNCTION IS NOT PREASSIGNED]

[P0511] FCT. KEY 12
[FUNCTION IS NOT PREASSIGNED]

M30

Bosch-Automationstechnik

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Industriehydraulik
Postfach 30 02 40
D-70442 Stuttgart
Telefax (07 11) 8 11-18 57

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Fahrzeughydraulik
Postfach 30 02 40
D-70442 Stuttgart
Telefax (07 11) 8 11-17 98

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Pneumatik
Postfach 30 02 40
D-70442 Stuttgart
Telefax (07 11) 8 11-89 17

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Montagetechnik
Postfach 30 02 07
D-70442 Stuttgart
Telefax (07 11) 8 11-77 12

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Antriebs- und Steuerungstechnik
Postfach 11 62
D-64701 Erbach
Telefax (0 60 62) 78-4 28

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Schraub- und Einpreßsysteme
Postfach 11 61
D-71534 Murrhardt
Telefax (0 71 92) 22-1 81

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Entgrattechnik
Postfach 30 02 07
D-70442 Stuttgart
Telefax (07 11) 8 11-34 75

Ihr Ansprechpartner

BOSCH

Robert Bosch GmbH
Geschäftsbereich
Automationstechnik
Antriebs- und Steuerungstechnik
Postfach 11 62
D-64701 Erbach
Telefax (0 60 62) 78-4 28

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